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PATENT SPECIFICATION

DRAWINGS ATTACHED

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COMPLETE SPECIFICATION

Improvements in and relating to Liners for Milking Machines

I, JOSEPH HOLGATE COOPER, a British subjet, of 14 Green Island, Irton near Scarborough, Yorkshire, do hereby declare the invention, for which I pray that a patent may be granted to me, and the method by which it is to be performed, to be particularly described in and by the following statement:—

The present invention relates to improvements in tubular liners of natural or synthetic or blends of natural and synthetic rubber, as used in milking machines, such liners being contained in a rigid tubular or cup-like outer shell and milking being carried out by applying one end of the rubber liner over the teat of the animal and thereafter applying continuous suction at the other end of the tubular liner and intermittent or pulsating suction to the annular space between the exterior of the liner and the wall of the shell.

The loss in milking efficiency and therefore the useful life of the liners is largely determined by changes from the original shape which occur in the liners due to absorption by the rubber of fats and greases from the cow's teat and from milk. Such change of shape, due to what is commonly referred to as "fat swelling" often leads to so-called teat cup crawl when the teat becomes more and more enclosed in the pulsating swollen liner with the result of much reduced rate of flow of milk.

It is an object of the invention to provide an improved form of liner for teat-cups of milking machines with which changes from the original shape due to fat swelling take place more slowly than hitherto with consequent increase in the useful life of the liner.

In accordance with the present invention there is provided a tubular liner for a teat-cup of a milking machine, in which the internal and/or external surface of the liner, at least at a portion thereof intended to be housed in the rigid shell of the teat-cup, has an elliptical or approximately elliptical cross-section with the parts of the wall of the liner at the ends of the minor axis of the ellipse thicker than the parts at the ends of the major axis, the liner being provided with a deep hood to provide a substantial cushioning effect, the hood consisting of a widening of the liner at that end of the barrel of the liner intended to receive the teat of the animal, terminated by an inwardly directed annular flange.

With a liner designed as above the collapse or contraction of the liner when suction outside the liner is interrupted and atmospheric pressure restored, takes place primarily by approach of the thicker parts of the walls towards one another.

This form of collapse will ensure that the thicker parts of the wall of the liner make firmest engagement with the teat. Thus fats and grease from the cow's teat and also milk which is squeezed between the wall of the liner and the teat is guided for the most part into contact with and is absorbed by the thicker parts of the wall of the liner. Such thicker parts will swell proportionately less than would the thinner parts for the same amount absorbed.

Thus milking efficiency is maintained over longer periods of service and replacement of liners is less frequent.

The elliptical formation may be limited to the internal or external contour only and the difference between the major and minor axes may correspond to the total difference in diametrical wall thickness on those axes and in the at present preferred form the improved liners are of this character with the ellipse on the interior.

It is to be understood however that a major and minor axis difference may be employed which is greater or less than that of the diametrical wall thickness differentials.

The invention will now be described, by

way of example, with reference to the accompanying drawings wherein:—

Fig. 1 is a view in sectional elevation of a tubular liner according to the invention, the liner being shown in its operating position partially enclosed within a rigid outer shell,

Fig. 2 shows a cross-section of the liner taken along the line II—II of Fig. 1,

Fig. 3 shows a cross-section of the liner taken along the line III—III in Fig. 1,

Referring to Fig. 1, a tubular liner 11 in its operating position is partially enclosed within a rigid outer shell 12.

In order that the purpose of certain features of the liner 11 shall be more easily understood, the shell 12 will first be described.

The shell is of a general cylindrical form and has a symmetrical, inwardly projecting flange 13 formed around the edge of one end of the cylinder. As a typical example the shell is approximately 5" long, with an internal diameter of approximately 1½", the circular opening formed by the flange 13 having a diameter of approximately ¾". Within part of the wall of the shell 12 is a narrow passage 14 providing communication between an opening 15 leading to the interior of the shell 12, and a tube 16 extending downwards from the shell at the lower end, that is the end partially closed by the flange 13.

The liner 11 is a unitary structure and comprises a barrel 17, a hood 18 formed at the upper end of the barrel, that is the end remote from the said shell flange 13 when the liner is in its operating position, and tubular extension 19 formed on the lower end of the barrel and extending through the opening formed by the shell flange 13.

The barrel 17 extends over about 3½ inches of the axial length of the liner. The cross-section of the internal surface of the barrel is elliptical at the upper end, that is to say in the region of the junction of the barrel with the hood, and circular at the lower end. The cross-section of the internal surface gradually merges from an ellipse at the upper end to a circle at the lower end. The axial length of that part of the barrel which is appreciably elliptical is about 3 inches. The barrel in the case illustrated, also tapers towards the lower end and is of circular external form having an external diameter of about 1.125 inches at the line II—II and an external diameter of about 0.75 inches at the line III—III. The variation in the wall thickness is achieved by the use of an approximately elliptical cross-section of the internal surface.

Fig. 2 shows a cross-section of the barrel 17 along the line II—II in Fig. 1. On the major axis 25 of the internal ellipse the wall thickness is about 0.100 inches and this merges into a wall thickness of about 0.125 inches on the minor axis 26.

Fig. 3 shows a cross-section of the barrel 17 along the line III—III in Fig. 1. At this part of the barrel the wall thickness is constant at about .125 inches. The cross-section of the internal surface of the barrel merges gradually from an elliptical form at the line II—II (Fig. 1) to a circular form at the line III—III (Fig. 1).

Referring again to Fig. 1, the hood 18 is formed as a widening of the liner terminated by an inwardly directed annular flange 20. The internal diameter at the widest part of the hood is approximately twice that of the upper end of the barrel.

The exterior of the underside of the hood is shaped to provide a shallow lip 21 and groove 24 to make fitting and sealing engagement with the open end 22 of the shell 12. In its operating position the liner 11 is held slightly in tension by the shell 12 which at one end presses against the lip 21 and at the other end by engagement of the flange 13 with one of a number of spaced annular ridges 23 formed around the tubular extension 19.

In operation, the teat of the cow to be milked may extend up to about two thirds of the way into the barrel 17 and the liner 11 is held on the teat by a gentle gripping action of the hood-flanged edges 20. Milking is effected by the application of a steady suction to the tubular extension 19 and an intermittent pulsating suction to the tube 16.

The liner is formed with a deep hood to give a substantial cushioning effect. If a teat is gripped by a tight hard hood the last of the milk, or strippings, is prevented from leaving the udder when the internal pressure thereof has dropped. The collection of these strippings causes delays in milking. The use of the deep hood 18 reduces these delays.

The liner 11 is provided with pipe-like projections of which two are shown at 24 in diametrically opposed positions on the exterior of the tubular extension 19. These pips serve as stops limiting the extent of axial movement imparted to the liner to free it from its working position in the shell 12 when it is desired to to immerse the inverted assembly between milkings in a cleansing and sterilising fluid such as caustic soda. The shell 12 may be moved along the liner 11 until the shell flange 13 engages the pips 24, whereupon cleansing fluid may enter between end 22 of the shell and lip 21 of the hood. It will be appreciated that the lip 21 is shallow so that a minimum of cleansing fluid is retained thereby on removal of the inverted assembly from the fluid.

The pips 24 are of a size such that they can be deformed by exceptional pressure to pass the partially closed end of the shell when a liner is to be replaced.

In another embodiment of the invention (not shown) a liner is provided wherein the

barrel is not tapered. Thus, for example, a liner having the same general dimensions as that previously described, has a barrel of constant external diameter of, for example, 1.1 inches. At the upper end of the barrel, that is at the junction of the barrel with the hood, the cross-section of the internal surface of the barrel is elliptical, the wall thickness on the major axis being about 0.100 inches, and that on the minor axis being about 0.125 inches. The cross-section of the internal surface gradually merges to that of a circle at the lower end of the barrel, the wall thickness at that lower end being 0.100 inches.

WHAT I CLAIM IS:—

1. A tubular liner for a teat-cup of a milking machine, in which the internal and/or external surface of the liner, at least at a portion thereof intended to be housed in the rigid shell of the teat-cup, has an elliptical or approximately elliptical cross-section with the parts of the wall of the liner at the ends of the minor axis of the ellipse thicker than the parts at the ends of the major axis, the liner being provided with a deep hood to provide a substantial cushioning effect, the hood consisting of a widening of the liner at that end of the barrel of the liner intended to receive the teat of the animal, terminated by an inwardly directed annular flange.

2. A tubular liner according to claim 1, wherein the elliptical formation is limited to the internal surface only and the difference between the major and minor axes corresponds to the total difference in diametrical wall thickness on those axes.

3. A tubular liner according to claim 1 or 2, wherein the said cross-section of the barrel of the liner gradually merges from an elliptical or approximately elliptical form at one portion of the barrel to a generally circular form at another portion.

4. A tubular liner according to claim 1, 2 or 3, wherein the barrel of the liner is tapered from the end intended to receive the teat of the animal to the other end.

5. A tubular liner according to claim 1, 2, 3 or 4, wherein the internal diameter at the widest part of the hood is approximately twice that of the said end of the barrel.

6. A tubular liner according to any of claims 1 to 5, wherein the exterior of the underside of the hood is shaped to provide a shallow lip and groove to make fitting and sealing engagement with one end of the said rigid shell when the liner is in its operating position.

7. A tubular liner for a teat-cup of a milking machine substantially as hereinbefore described with reference to Figs. 1, 2 and 3 of the accompanying drawings.

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6, Bream's Buildings, London, E.C.4.

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1 SHEET This drawing is a reproduction of the Original on a reduced scale

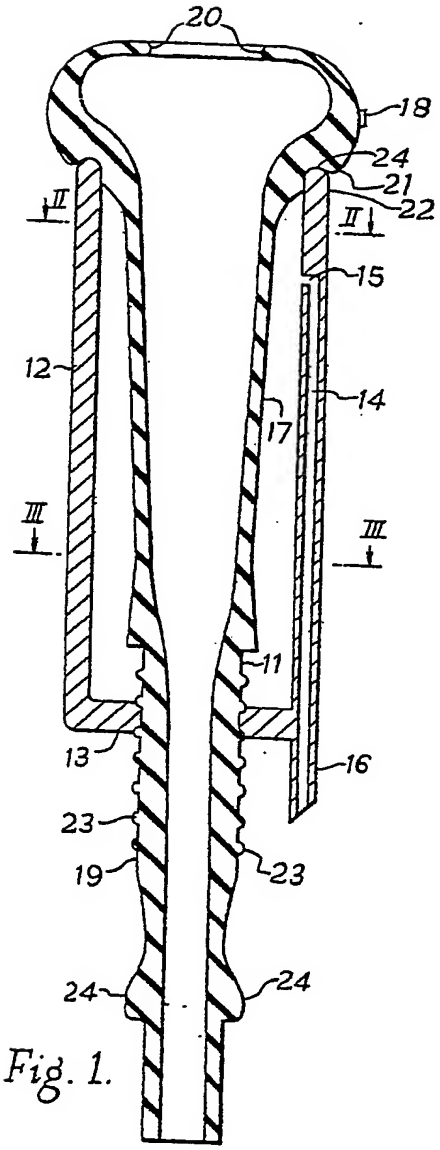

Fig. 1.

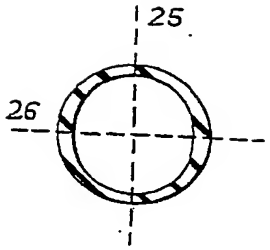

Fig. 2.

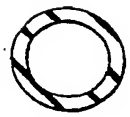

Fig. 3.